# Use of NASA EOS Data in Weather Applications

NASA SPoRT Project - Short-term Prediction Research and Transition (SPoRT) project transitions EOS data to operational weather community to improve short term weather forecasts on a regional and local scale

- *transition real-time MODIS and AIRS data and near real-time AMSR-E , CloudSat and other EOS products*
- *match data to forecast problems*
- *integrate data and solution into operational decision support system*
- *evaluate impact on forecast process and decisions*

NWS forecaster using NASA lightning data to warn of tornado
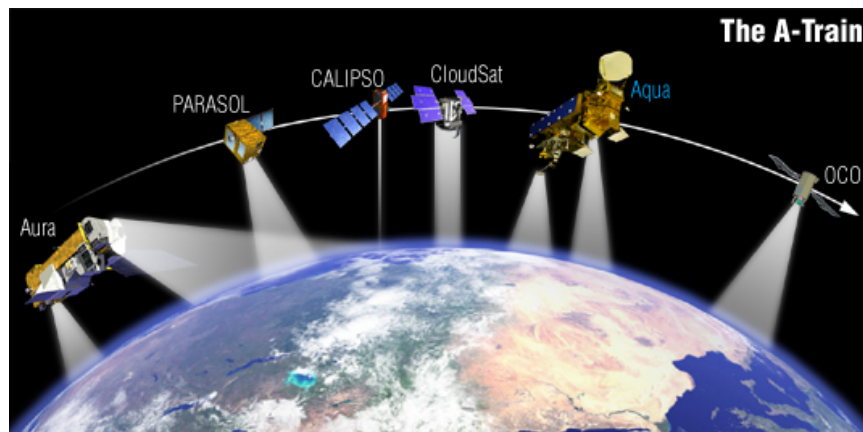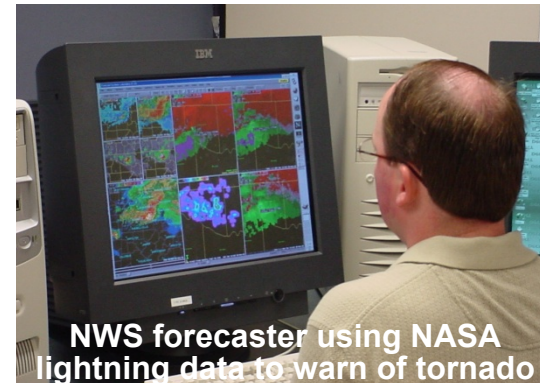
Benefit

- new and proven capabilities are transitioned to NOAA / NWS and private weather sector for operational use
- prepares forecasters for next generation satellites NASA is helping NOAA build
- <u>helps saves lives through better preparedness and warning</u>

End users of data: Numerous NWS WFOS and private sector entities

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Lessons Learned – Weather Applications

User requirements

- Need for day / night observations and of atmospheric and surface (land and ocean) conditions and products that help diagnose current weather conditions or help predict future state of atmospheric and surface conditions – highest resolution possible!

- Data must be timely, accurate, easy to understand and use, available in a variety of formats for ingest into their decision systems

- Can't "throw data over the fence" – users need help using information

Demands on missions

- Need to provide access to real-time data – direct broadcast

- A suite of products must be readily available (in real-time) to address weather needs – most users don't have knowledge / resources to produce their own
    - product algorithms linked to real-time data sources
    - proven "science team" algorithms

- Real-time data and product "warehouse" and distribution system (e.g., real-time CLASS or LANCE system) – need digital data, not just "pictures"!
    - variety of formats – netCDF, kml, etc.
    - subset tools – reduces data volume or changes coverage region
    - "subscription" for rapid product pushes

SP⊕RT

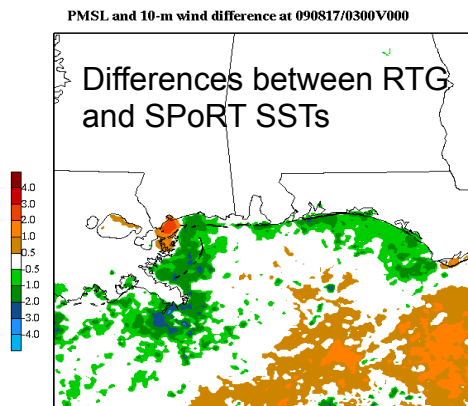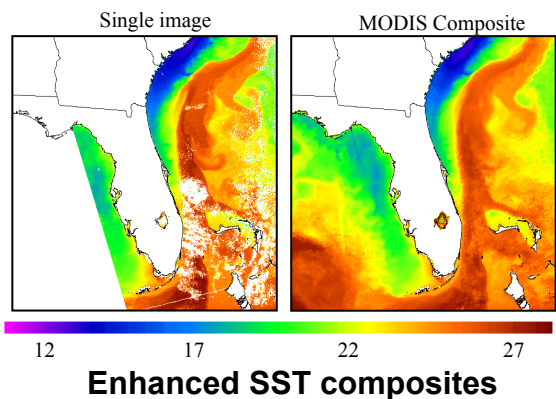transitioning unique NASA data and research technologies to operations

Products to End Users

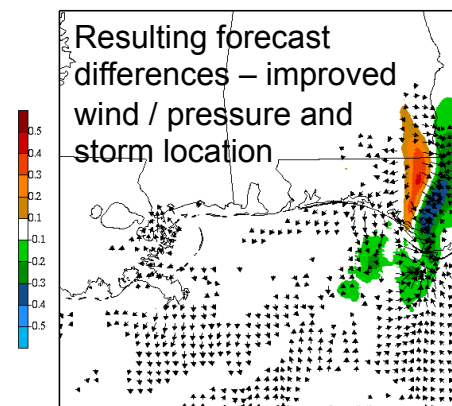| INSTRUMENT / PRODUCT	RESOLUTION	END USER	DSS	FORMAT
MODIS				
Channel imagery (vis, 3.9, 6.7, 11 μm)	4 km (CONUS), 1 km (regional), 500 m (state), 250 m (WFO scale)	Selected WFOs	AWIPS, AWIPSII	netCDF, McIDAS
Multispectral composite images natural and false color (snow)	4 km (CONUS), 1km (regional), 500m (state)	Selected WFOs	AWIPS, AWIPSII	netCDF, McIDAS
Derived image products				
clouds (mask, CTP, phase)	4 km (CONUS)	Selected WFOs	AWIPS, AWIPSII	netCDF, McIDAS
fog and low cloud (11– 3.9 μm)	4 km (CONUS), 1 km (regional)	Selected WFOs	AWIPS, AWIPSII	netCDF, McIDAS
LST, SST, LI, TPW	4 km (CONUS), 1 km (regional)	Selected WFOs	AWIPS, AWIPSII	netCDF, McIDAS
Temporal composite images				
SST, chlorophyll	4 km, 2 km, 1 km	NSSL (HWT), SR Coastal WFOs, private wx users	AWIPS, AWIPSII, other	netCDF, McIDAS, GRiB
Non-image data				
fire and burn areas	CONUS	WFOs	AWIPS II	shape file
AMSR-E				
Rain rate, convective fraction, cloud water	5 km (CONUS); 21 km	Selected WFOs	AWIPS, AWIPSII	netCDF, McIDAS
SSTs	38 km (CONUS)	Selected WFOs	AWIPS, AWIPSII	netCDF, McIDAS
Total lightning data				
NALMA/DCLMA total lightning source densities	2 km / 2 minutes	Selected WFOs	AWIPS, AWIPSII	netCDF, GRiB
Combined Instrument products				
MODIS/AMSR-E SST composite	1 km (NA coastal regions)	Coastal WFOs (Dec 2009)	AWIPS, AWIPSII	netCDF, McIDAS
POES/GOES SSTs	9 km (NH)	TWC / WFOs (Oct 2009)	AWIPS, AWIPSII	GeoTIFF, netCDF, McIDAS
Blended TPW (from CIRA)	16 km (NH)	Selected WFOs	AWIPS, AWIPSII	netCDF, McIDAS
MIMIC TPW (from U. Wisconsin)	10 (NH)	The Weather Channel	--	GeoTIFF
GOES				
Channel imagery (vis, IR, WV)	1 km, 4 km	The Weather Channel	--	GeoTIFF
Aviation products (fog depth, icing, low cloud base (from NESDIS)	4 km (CONUS)	Selected WFOs	AWIPS, AWIPSII	netCDF, McIDAS
GOES-R				
GLM proxy extent density	10 km / 2 minutes	SPoRT	AWIPSII	GRiB
ABI proxy imagery (vis, IR, WV) – October 2009	500 m, 1 km	SPoRT	AWIPSII	McIDAS
Miscellaneous				
WRF daily forecasts w/ MODIS SSTs (init. 00Z, 36 h forecasts) (from NSSL/HWT)	4 km (CONUS)	Selected WFOs	AWIPS, AWIPSII	GRiB
Surface parameter analysis (T, Td, RH, wind, SSTs) – SPoRT ADAS	2 km	Selected WFOs	AWIPS, AWIPSII	GRiB

Selected SPoRT Unique Capabilities

Single image   MODIS Composite

12   17   22   27
Enhanced SST composites

PMSL and 10-m wind difference at 090817/0300V000
Differences between RTG and SPoRT SSTs

Improved WRF EMS forecasts

Resulting forecast differences – improved wind / pressure and storm location

- *improved forecasts from inserting NASA data in WRF EMS*

MODIS Night-time Fog Product

Blended TPW monitors moisture in void regions
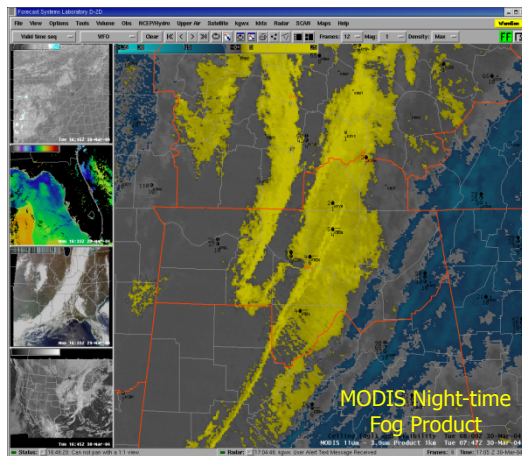
MODIS fog product complements GOES data

MODIS color 20070814 20:37:00 UTC Data from UW/SSEC

Wildfire and and smoke detection
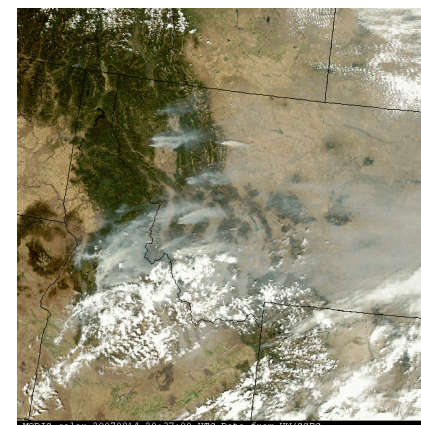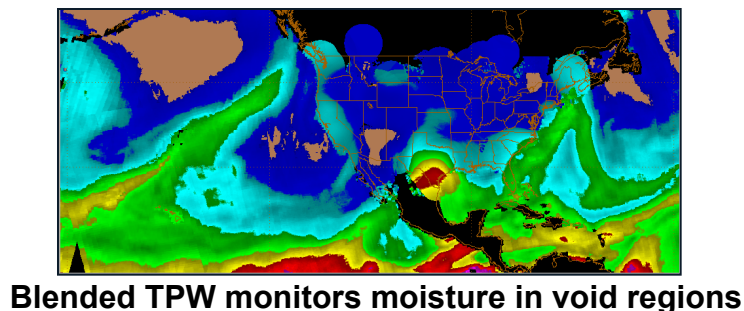
- *improved situational awareness from use of NASA data*

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